

WHAT IS CLAIMED IS:

1. A fuel cell, comprising:
an electrolyte comprising at least one proton conductor;
a fuel electrode provided on a first side of the electrolyte;
5 an oxidant electrode provided on a second side of the electrolyte;
at least one internal electrode provided in the electrolyte; and
an electric voltage application means provided either between the internal
electrode and the fuel electrode or between the internal electrode and the
oxidant electrode.
- 10 2. The fuel cell according to Claim 1, wherein the internal electrode is a
single layer.
3. The fuel cell according to Claim 1, wherein the internal electrode
15 comprises a plurality of layers.
4. The fuel cell according to Claim 1, wherein the electrolyte comprises
at least one ion exchange membrane.
- 20 5. The fuel cell according to Claim 1, further comprising at least one fuel
selected from the group consisting of hydrogen, methanol, and a
mixture thereof.
- 25 6. The fuel cell according to Claim 1, wherein the electric voltage
application means comprises at least one potentiostat electrically
connected between the internal electrode and the fuel electrode.
7. The fuel cell according to Claim 1, wherein the electric voltage
application means comprises at least one potentiostat electrically
30 connected between the internal electrode and the oxidant electrode.
8. The fuel cell according to Claim 1, wherein the potential of the internal
electrode layer is controlled by a potentiostat electrically connected
between the internal electrode and the fuel electrode.

9. The fuel cell according to Claim 1, wherein the potential of the internal electrode layer is controlled by a potentiostat electrically connected between the internal electrode and the oxidant electrode.
- 5 10. The fuel cell according to Claim 1, wherein the internal electrode comprises particles of one or more catalysts on one or more supports and sandwiched by a plurality of proton conductors.
- 10 11. The fuel cell according to Claim 1, wherein the internal electrode comprises particles of one or more catalysts on one or more supports and sandwiched by a plurality of proton conductors, and wherein said catalyst comprises platinum.
- 15 12. The fuel cell according to Claim 1, wherein the electrolyte comprises a high polymer solid electrolyte.
- 20 13. The fuel cell according to Claim 1, further comprising one or more collectors.
- 25 14. The fuel cell according to Claim 1, further comprising a conduit means for transporting one or more fluids selected from the group consisting of fuel, hydrogen, methanol, oxygen, air, water, and a mixture thereof to or from the fuel cell.
- 30 15. A method for generating electricity, comprising contacting at least one fuel and at least one oxidant with the fuel cell as claimed in Claim 1.
16. A method for making the fuel cell as claimed in Claim 1, comprising electrically connecting the electric voltage application means between the internal electrode and the fuel electrode or between the internal electrode and the oxidant electrode.
17. The method according to Claim 16, wherein the electric voltage application means comprises at least one potentiostat electrically

connected between the internal electrode and the fuel electrode or
between the internal electrode and the oxidant electrode.

18. A method for controlling a fuel cell,
the fuel cell comprising:

5

an electrolyte comprising at least one proton conductor;
a fuel electrode provided on a first side of the electrolyte;
an oxidant electrode provided on a second side of the electrolyte;
at least one internal electrode provided in the electrolyte;

10

the method comprising:
controlling a movement of the fuel or the oxidant in the electrolyte by
applying an electric voltage either between the internal electrode and
the fuel electrode or between the internal electrode and the oxidant
electrode.

15

19. The method according to Claim 18, wherein the electric voltage is
controlled by at least one potentiostat.

20